

Economic Analysis of Water Quality Based Effluent Limits for the Chinook Wastewater Treatment Facility

EPA has requested an economic analysis of water quality based effluent limits for nutrients for the City of Chinook wastewater treatment plant (WWTP), based on EPA Guidance and practice, and data availability. Abt Associates conducted a preliminary analysis consistent with EPA's Interim Economic Guidance for Water Quality Standards (U.S. EPA, 1995), and publicly available data. We present a summary of the analysis and our conclusions below. Since we limited our review to the economic analysis, we did not review the appropriateness of the water quality targets and resulting effluent limitations, or other potential bases for a variance.

1 Background

The City of Chinook WWTP is an oxidation ditch activated sludge system that includes the following equipment: mechanically-cleaned bar screen, comminuter, grit chamber, raw sewage screw pumps, oxidation ditch with slow mixers, two secondary clarifiers, effluent disinfection with ultraviolet (UV) light, and sludge handling that includes an aerobic digester (Montana DEQ, 2011). Based on recent discharge monitoring report (DMR) data, nutrients in the facility's discharges have been as high as 28.4 milligrams per liter (mg/L) total nitrogen (TN) and 3.12 mg/L total phosphorus (TP). The facility reports that recent process optimization efforts have reduced average effluent concentrations to 1.5 mg/L TN and 0.46 mg/L TP. Future average monthly limits for the facility would be 3.4 mg/L TN and 0.159 mg/L TP. Therefore, the facility could require upgrades to comply with the new limits (at least for TP and possibly for TN, if recent process optimization results cannot be maintained consistently).

2 Estimating Costs

We developed a preliminary estimate of incremental compliance costs to reach these permit limits using a Water Environment Research Foundation (WERF) report (WERF, 2011) that provides estimates of costs for hypothetical treatment trains providing various levels of nutrient removal. Specifically, Table 4-3 of WERF (2011) provides unit cost data that are based on flow (e.g., dollars per gallon per day capacity) for each of several levels of treatment. The WERF treatment levels are designed to meet the nutrient limits shown in Exhibit 2-1.

Exhibit 2-1: WERF (2011) Treatment Level Objectives

Level	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
1	No removal	No removal
2	8	1
3	4 to 8	0.1 to 0.3
4	3	0.1
5	<2	<0.02

Based on the available information, the facility's existing treatment train most closely resembles WERF level 1.¹ Therefore, for this analysis, we assume the existing equipment at the facility is equivalent to WERF's level 1 treatment train.

The facility's permit statement of basis (Montana DEQ, 2011) reports a design flow average of 0.5 million gallons per day (MGD) and a maximum daily design flow of 1.07 MGD. It reports an actual average flow of 0.11 MGD for the period January 2008 through December 2011. For this analysis, we use the design flow average of 0.5 MGD to estimate capital costs because the WERF capital estimates are scaled to an annual average design flow.² We use the actual average flow of 0.11 MGD to estimate operating costs because long-term ongoing operating requirements are most likely to reflect this flow.

For level 1 treatment, WERF (2011) estimates capital costs of \$9.3 million per million gallons per day (MGD) capacity and operations cost of \$250 per million gallons treated. Applying these costs to the design and average flow for Chinook results in a total capital cost of \$4.65 million and an operating cost of approximately \$10,000 per year (assuming year-round operation). We used the Engineering News Record (ENR) construction cost index (CCI) to escalate capital costs to current dollars by multiplying by 1.08.³ Because WERF's operating costs are based on energy and chemical costs, we used the consumer price index (CPI) to escalate operating costs to current dollars by multiplying by 1.05.⁴ This escalation results in a total capital cost of \$5.03 million and an operating cost of approximately \$10,600 per year in current year dollars.

The facility's recent process optimization efforts appear to have reduced TN below the future nutrient limit of 3.4 mg/L. However, if the facility cannot maintain these recent results, meeting the future TN limit could require treatment corresponding to WERF level 4. In either case, the facility's recent TP concentrations are greater than the future nutrient limit of 0.159 mg/L, even after optimization. If ongoing optimization efforts cannot consistently reduce TP further, meeting the future TP limit would require treatment corresponding to WERF level 3 or level 4. To provide a margin of safety, we assumed that level 4 treatment would be required to guarantee meeting the future limit for TP (and possibly also to meet the future limit for TN). This assumption is conservative because, given the process optimization efforts, the facility might require less extensive upgrades to achieve the necessary reductions.

¹ Minor differences include that the facility uses UV instead of sodium hypochlorite for disinfection and includes aerobic, instead of anaerobic, digestion. The method used here to calculate incremental compliance costs effectively "nets out" the costs of the disinfection and sludge digestion portions of the treatment train. Therefore, these minor differences are not expected to have a significant impact on the cost estimates.

² The WERF estimates also assume a peaking factor of 3. In comparison, based on the reported design average and maximum flows, the existing Chinook facility appears to be designed for a peaking factor of approximately 2. If facility upgrades were designed using this lower peaking factor, the cost estimates here would overestimate actual costs.

³ The average ENR CCI for 2014 was 9806 and the average ENR CCI for 2011 was 9070, resulting in an escalation factor of $9806 / 9070 = 1.08$.

⁴ The CPI for 2014 was 236.736 and the average CPI for 2011 was 224.939, resulting in an escalation factor of $236.736 / 224.939 = 1.05$.

For level 4 treatment, WERF (2011) estimates capital costs of \$15.3 million per MGD capacity and operations cost of \$880 per million gallons treated. Applying these costs to the design and average flow for Chinook results in a total capital cost of \$7.65 million and an operating cost of approximately \$35,300 per year (assuming year-round operation). Applying the escalation factors discussed above results in a total capital cost of \$8.27 million and an operations cost of approximately \$37,200 per year in current year dollars.

The incremental capital cost for upgrading from WERF level 1 treatment, which the Chinook facility appears to resemble, to WERF level 4 treatment, which would be required to meet the future limits, would be \$8.27 million – \$5.03 million = \$3.24 million. The incremental difference in operating costs between WERF level 1 and WERF level 4 would be \$37,200 - \$10,600 = \$26,600 per year.

The WERF (2011) unit operating costs include energy and chemical costs only, not labor. Although incremental labor requirements can be minimized when automated controls are present, labor costs can be highly dependent on site-specific factors (U.S. EPA, 2008). For conventional activated sludge treatment as a whole, however, estimated labor costs can be as much as two-thirds of total annual operating costs (Young et al., 2012). Therefore, to account for potential incremental labor, we multiply the incremental operating cost by three to \$79,900 per year. Note that this incremental operating cost assumes year-round operation. Actual incremental operating costs would be lower if the nutrient criteria do not apply year-round and if elements of the upgraded treatment system could be shut down, bypassed, or placed on standby during the period when the criteria do not apply.

We annualized incremental capital costs over 20 years using an interest rate for revenue bonds of 2.5%, which is the current rate for the Montana Water Pollution Control State Revolving Fund (Montana DEQ, 2015). We added the incremental operating costs, including labor, to arrive at a total annualized cost of \$287,737 per year.

For purposes of sensitivity and uncertainty analysis, we also examined the impact of alternative assumptions used in Montana DEQ's previous economic analysis (Blend and Suplee, 2011). Montana DEQ's previous analysis examined various scenarios that included two different interest rates: 5% and 7%. The previous analysis also used a different method to estimate labor costs. Instead of applying a multiplier to annual operating costs, it estimated labor costs as a percentage of annualized capital costs. The scenarios examined used two different labor percentages: 15% and 48%.⁵

Based on the range of scenarios examined in Montana DEQ's previous analysis, we calculated results using two sets of alternative assumptions. Alternative 1 combines the lower interest rate

⁵ Montana DEQ's previous analysis also examined different assumptions about the percent of flow treated by reverse osmosis. Because meeting future nutrient limits at this facility would not require reverse osmosis, those assumptions have no effect on the analysis here.

of 5% with the lower labor estimate of 15% of annualized capital cost. Alternative 2 uses the higher interest rate of 7% and the higher labor estimate of 48% of annualized capital cost. Exhibit 2-2 compares our cost estimates with results using these alternative assumptions.

Exhibit 2-2: Annualized Costs Using Alternative Financing and Labor Assumptions

Scenario	Interest Rate	Labor	Total Annualized Cost (\$/year)
Standard	2.5%	2/3 of total operating cost	\$287,737
Alternative 1	5%	15% of annualized capital cost	\$325,586
Alternative 2	7%	48% of annualized capital cost	\$479,233

3 Municipal Preliminary Screener

To demonstrate that the costs of pollution control would result in substantial and widespread economic and social impacts justifying a variance, the discharger must first demonstrate that it would face substantial financial impacts through a two-part test, including a municipal preliminary screener (MPS) and Secondary Test. The first step in determining whether impacts will be substantial involves combining the estimated compliance costs with existing pollution control costs, and comparing the result (on a per-household cost basis) to median household income (MHI) to obtain an MPS value.

We assumed that households currently pay for 100% of existing costs, and that they would also pay 100% of project costs. Information on commercial and industrial contributors is not available. Additionally, we estimated existing household costs based on sewer revenues from user charges in 2014 from the City of Chinook (2015a) and we derived the number of households from the population served (from Montana DEQ, 2011) and the persons per household in Chinook (from U.S. Census Bureau, 2013a).

Exhibit 3-1 shows the assumptions and data sources for the MPS calculation. Based on the assumptions and data shown, we calculate that the project could result in an MPS of 2.8%. Using the alternative interest rates, labor costs, and annual project costs shown in Exhibit 2-2 (and all other assumptions the same as Exhibit 3-1), the MPS would be 2.9% (Alternative 1) or 3.5% (Alternative 2).

According to EPA's 1995 Guidance, this indicates that the project may result in substantial economic impacts, and a Secondary Test is appropriate.

Exhibit 3-1: Municipal Preliminary Screener for Chinook WWTP

Variable	Estimate	Data Source
Capital costs	\$3.24 million	See Section 2
Annual O&M costs (electricity, chemicals, and labor)	\$79,900	See Section 2

Interest rate for revenue bonds (for annualizing capital costs)	2.5%	Current interest rate for Montana Water Pollution Control State Revolving Fund (Montana DEQ, 2015)
Time period of financing (for annualizing capital costs)	20 years	
Annual project costs	\$287,737	Annualized capital plus annual O&M
Total existing costs	\$446,863	City of Chinook (2015a)
WWTP service population	1,200	Montana DEQ (2011)
Persons per household	1.73	U.S. Census Bureau (2013a) indicates that Chinook has 1,210 people in 701 households
Number of households served	694	Service population divided by persons per household in Chinook
Annual existing costs paid by households	\$446,863	In the absence of data on non-residential users, we assume that 100% of existing costs are borne by households
Existing annual per-household costs	\$644	Annual existing costs paid by households divided by number of household served ¹
Amount of annual project costs to be paid by households	100%	Same as share of existing costs borne by households
Annual per-household pollution control project cost	\$415	Household share of annual costs divided by number of households
Total annual cost of pollution control per household	\$1,059	Household existing costs plus project costs
Median Household Income (2013\$)	\$37,656	U.S. Census Bureau (2013b)
Median Household Income (2014\$)	\$38,267	Adjusted based on Consumer Price Index (2014=236.74; 2013=232.96)
Municipal Preliminary Screener (MPS)	2.8%	Total annual cost of pollution control divided by median household income
Alternative 1 MPS ²	2.9%	
Alternative 2 MPS ³	3.5%	

O&M = operations and maintenance

1. The City of Chinook (2015b) notes that the minimum monthly sewer charge is \$48.74 with an additional charge of \$0.60 per 100 gallons over 2,000 gallons. Assuming the average Chinook household uses 5,000 gallons of water per month, this equates to \$804 per year [\$49 plus (\$0.006 per gallon times 3,000 gallons) times 12 months]. As such, existing household costs may be underestimated; if actual existing household costs are higher, then the MPS for the City would also be higher.

2. Alternative 1 assumes an annual project cost of \$325,586 (Exhibit 2-2), which yields annual per-household project costs of \$469 (\$325,584 divided by the number of households) and total annual household costs of \$1,113 (annual household project costs plus existing annual household costs).

3. Alternative 2 assumes an annual project cost of \$479,233 (Exhibit 2-2), which yields annual per-household project costs of \$691 (\$479,233 divided by the number of households) and total annual household costs of \$1,335 (annual household project costs plus existing annual household costs).

We estimated that the facility serves 694 households, on the basis of the service population (1,200) and the persons per household in Chinook (1.73 based on U.S. Census Bureau 2013a). We conducted an additional analysis to determine the sensitivity of the MPS result to this assumption. Increasing the number of households by 25% to 867 would reduce the total annual

cost of pollution control per household to \$847, and the MPS would be 2.2%. For an MPS below 2%, the number of household would need to be higher than 960, or 38% higher than estimated (keeping all other assumptions in Exhibit 3-1 the same).

Lacking information on the share of costs borne by households, we assumed the household share of existing and project costs is 100%. However, the MPS result is not sensitive to this assumption. Keeping all other assumptions in Exhibit 3-1 the same, the household share would need to be less than 30% in order for the MPS to be below 2%. Given that the facility's permit fact sheet indicates that there are no major industrial or commercial users, it is unlikely that households bear less than 30% of costs.

4 Secondary Test

If the MPS indicates that the economic effects of the pollution control project may be substantial (with a borderline impact being between 1% and 2% and a large impact being over 2%), the next step is to use the Secondary Test to evaluate the community's ability to obtain financing as well as general socioeconomic health. The Secondary Test is designed to build upon the characterization of the financial burden identified in the MPS. Indicators describe pre-compliance debt, socioeconomic, and financial management conditions in the community. For more information on the need for the Secondary Test, see the Appendix and U.S. EPA (1995).

Section 4.1 shows the Secondary Test for Chinook using U.S. EPA (1995) and Section 4.2 shows Montana's alternative Secondary Test (Montana DEQ, 2014), which eliminates debt and financial management indicators in favor of socioeconomic indicators. For more details on Montana's modified Secondary Test, see Exhibit 4-1 and Section 4.2.

Exhibit 4-1. Comparison of EPA 1995 Guidance and MT DEQ Guidance: Secondary Test of Substantial Impact, Public Entities

EPA Indicator	Interpretation	MT DEQ Indicator
<i>Debt Indicators</i>		
Bond Rating	Indicates the community's credit capacity.	None
Overall Net Debt as a Percent of Full Market Value of Taxable Property	Indicates the debt burden on residents and measures the ability of the community to issue additional debt.	None
<i>Socioeconomic Indicators</i>		
Unemployment Rate	Indicates the general economic health of the community.	Unemployment Rate
Median Household Income	Indicates overall wealth of the community.	Median Household Income Poverty rate ^a LMI percentage rate ^b
<i>Financial Management Indicators</i>		

Property Tax Revenue as a Percent of Full Market Value of Taxable Property	Indicates the funding capacity to support new expenditures, based on the wealth of the community.	$(\text{Property Tax} + \text{Fees} + \text{Revenues}) / \text{MHI} / \text{Population} \times 100^c$
Property Tax Collection Rate	Indicates the efficiency of the tax collection system and measures how well the local government is administered.	None
a. Evaluated as follows: strong: < 6%; midrange: 6% to 40%; and weak: >40%. b. Low to medium income (LMI) percentage rate, defined as the percent of population earning 200% of the poverty threshold or below. Evaluated as follows: strong: < 10%; midrange: 10% - 45%; weak: >45%. c. Evaluated as follows: strong: <1.5; midrange: 1.5 – 3.5; weak: >3.5.		

4.1 Secondary Test Based on EPA Guidance

To conduct the Secondary Test for Chinook using U.S. EPA (1995) Guidance, we used socioeconomic data from the U.S. Census Bureau (2013a; 2013b; 2013c), information about property values from Montana Department of Revenue (2015), and other financial data from Chinook’s 2014 Annual Financial Report (AFR; City of Chinook, 2015a).

Debt Indicators

Debt indicators include the bond rating, which provides a measure of the creditworthiness of the community, and the overall net debt as a percent of the full market value of taxable property, which is a measure of the debt burden on residents in the community and a measure of the ability of local government jurisdictions to issue additional debt.

We did not find a bond rating for the City of Chinook (nor for any entity in Chinook such as a school district). As noted by U.S. EPA (1995), the absence of a bond rating does not indicate strong or weak financial health. Consistent with U.S. EPA (1995), we excluded this metric from the calculation of the Secondary Score.

The 2014 AFR does not show any debt for the community to be repaid by property taxes, nor any overlapping debt (such as for a school district). The 2015 Certified Taxable Valuation (Montana Department of Revenue, 2015) shows that the 2015 total market value was \$81,174,681. Based on this, the overall net debt as a percent of full market value of taxable property is zero.

However, this calculation does not fully reflect the amount of debt owed by the community, nor its potential ability to issue additional debt. The City also has \$1,375,625 in long-term debt for sewer and water systems (City of Chinook, 2015a), which are typically repaid with service fees. Although this debt is not repaid by property taxes, it impacts the community’s ability to take on debt, which is the purpose of this indicator. Had this additional debt been financed via general obligation bonds rather than revenue bonds, for example, it would be repaid via property taxes and included in the debt used for this indicator. Including both types of debt would result in overall net debt as a percent of full market value of taxable property of 1.7% (although full

market value of taxable property is not necessarily the appropriate comparison for both types of debt). As such, the City is still below 2% on this metric, which is considered “strong” based on U.S. EPA’s 1995 Guidance.⁶

Socioeconomic Indicators

Socioeconomic indicators include community-specific MHI (compared with the state level MHI) and the local unemployment rate (compared with the national rate). As shown in Exhibit 3-1, MHI for Chinook for the period 2009 to 2013 was \$37,656. Data from the U.S. Census Bureau (2013b) indicates that MHI for Montana during the same period was \$46,230.⁷ Since the City’s MHI is more than 10% below the state MHI, the City is weak on this indicator.

According to the United States Bureau of Labor Statistics, unemployment in Blaine County was at 4.8% in June 2015, compared with a national unemployment rate of 5.3%. Since the local rate is within 1% of the national rate, the City is mid-range on this indicator.

Financial Management Indicators

Financial management indicators include the property tax revenues as a percent of full market value of taxable property (“property tax burden”) and property tax collection rate. Property tax burden indicates the funding capacity to support new expenditures, based on the wealth of the community, while the property tax collection rate provides an indicator of the efficiency of the tax collection system and a measure of how well the local government is administered.

According to the AFR (City of Chinook, 2015a), property tax revenues for 2014 were \$585,430.⁸ As a share of the full market value of taxable property (\$81,174,681), property tax revenues are 0.7%. Since this is below 2%, the City is strong on the property tax burden metric. However, as with the debt indicator discussed above, debt for wastewater projects may not necessarily be repaid by property taxes (e.g. it is likely repaid by service fees), and this metric may not fully reflect the community’s ability to support new expenditures.

The AFR provides information for the property tax collection rate for the fiscal year 2014. U.S. EPA (1995) defines the property tax collection rate as the ratio of the actual amount collected from property taxes to the amount levied. However, the amount levied for the City of Chinook is not available in financial documents; as such, we used the ratio of the actual amount collected to the final amount budgeted.⁹ For fiscal year 2014, the final amount budgeted for the general fund, major funds, and non-major funds was \$570,183, while the actual amount collected for those funds was \$559,697, for a collection rate of 98.2%. As such, the City is strong on this indicator.

⁶ If overlapping debt is more than \$247,869 (and the water and sewer debt is included) then total debt would exceed 2% of the total market value of taxable property and the City would be mid-range on this metric rather than strong. See footnotes on Exhibit 4-3 for additional information about the impacts to the Secondary Score.

⁷ Income is not updated to current dollar years for the Secondary Test.

⁸ The Statement of Activities reports total property tax collections of \$696,123; however \$110,693 was deferred revenues, applicable to fiscal year 2015 rather than 2014.

⁹ City of Chinook (2015a) provides both the original budgeted amount and the final budgeted amount.

Secondary Test Data and Results

Exhibit 4-2 shows available data for the Secondary Test and Exhibit 4-3 provides the Secondary Score.

Exhibit 4-2: Secondary Test Data Based on EPA Guidance

Variable	Value	Data Source
Number of Households	694	see Exhibit 3-1
Median Household Income (2013\$)	\$37,656	see Exhibit 3-1
State Median Household Income	\$46,230	U.S. Census Bureau (2013b)
Community unemployment rate	4.8%	June 2015 unemployment rate for Blaine County from Bureau of Labor Statistics
National unemployment rate	5.3%	June 2015 unemployment rate for United States from Bureau of Labor Statistics
Market value of taxable property	\$81,174,681	2015 Total Market Value from the Montana Department of Revenue (2015)
Property tax collection rate	98.2%	Actual property tax collection for general, major, and non-major funds (\$559,697) divided by final budgeted amount for those funds (\$570,183) from City of Chinook (2015a) ¹
Direct net debt	\$1,375,625	Long-term debt for water and sewer systems from City of Chinook (2015a)
Overlapping debt	\$0	None listed in City of Chinook (2015a)
Property tax revenues	\$585,430	City of Chinook (2015a)
1. The 1995 Guidance defines the property tax collection rate as the ratio of the actual amount collected from property taxes to the amount levied. However, the amount levied for the City of Chinook is not available; as such, we used the ratio of the actual amount collected to the final amount budgeted.		

Exhibit 4-3: Secondary Score Based on EPA Guidance

Indicator	Result	Score
Bond Rating	Not Available	n/a
Overall Net Debt as Percent of Full Market Value of Taxable Property	1.7%	3
Unemployment	4.8% [compared to 5.3% nationally]	2
Median Household Income ¹	\$37,656 [compared to \$46,230 statewide]	1
Property Tax Revenues as a Percent of Full Market Value of Taxable Property	0.7%	3
Property Tax Collection Rate	98.2%	3
Average of Financial Management Indicators ²	$(3 + 3) \div 2$	3
<i>Secondary Score^{3,4}</i>		2.3

Source: See Exhibit 4-2.

1. Not updated for the Secondary Test.
2. If one of the debt or socioeconomic indicators is not available (in this case, the bond rating), the two financial management indicators (property tax revenues as a percent of full market value of taxable property and property tax collection rate) are averaged and this averaged value is used as a single indicator with the remaining indicators.
3. Average of scores for the following indicators: Overall net debt as a percent of full market value of taxable property, unemployment, median household income, and average of financial management indicators.
4. If overlapping debt is more than \$247,869 then overall debt would exceed 2% of the market value of taxable property, the City would have a score of 2 rather than 3 on the “overall net debt as a percent of full market value of taxable property” metric, and the Secondary Score would be 2.0 rather than 2.3.

4.2 Secondary Test Based on Montana Alternative

In comparison with EPA’s 1995 Guidance Secondary Test, the Montana DEQ (see Montana DEQ, 2014) has modified the Secondary Test such that much of the financial and debt information is not considered (eliminating both debt indicators in favor of socioeconomic indicators, and eliminating or altering both financial management indicators), but more information on household income is provided.¹⁰ Exhibit 4-4 shows the metrics and interpretation using Montana’s alternative approach. This section calculates the Secondary Score based on Montana’s alternative approach.

Exhibit 4-4. Secondary Test Based on Montana DEQ Guidance

Indicator	Weak (Score of 1)	Mid-Range (Score of 2)	Strong (Score of 3)
Poverty Rate	More than 40%	6 to 40%	Less than 6%
Low to Medium Income Percentage (LMI)	More than 45%	10 to 45%	Less than 10%
Unemployment	More than 1% above state average	State average	More than 1% below state average
Median Household Income	More than 10% below state median	State median	More than 10% above State median
Property Tax, fees and revenues ¹ divided by MHI and indexed by population	More than 3.5	1.5 to 3.0	Less than 1.5
1. The “property tax, fees, and revenues” metric includes the following items from the Statement of Activities: charges for services, fees, and forfeitures for governmental activities; charges for services, fines, and forfeitures for business-type activities; and property taxes for governmental activities.			

For the unemployment rate and MHI, we used the same data sources as cited in Exhibit 4-2. Because the local unemployment rate is within 1% of the state unemployment rate,¹¹ the City is mid-range on this indicator. As with the results using EPA’s Guidance, the City is weak on the MHI indicator since the local MHI is more than 10% below the state-level MHI. For the poverty

¹⁰ This approach assumes that “the ability of a community to finance a project may be dependent upon existing household financial conditions within that community” (Montana DEQ, 2014).

¹¹ Note that Montana’s alternate Secondary Test compares the local unemployment rate to the state, whereas EPA’s Guidance compares it to the national rate. In this case, however, either test yields a mid-range outcome for the City.

rate, data from U.S. Census Bureau (2013b) indicates that the 12.5% of all families in Chinook are below the poverty threshold, which is in the mid-range according to Montana’s Guidance. Based on data from U.S. Census Bureau (2013c), the City is also mid-range on the “Low to Medium Income Percentage” (LMI) indicator, with 37.6% of families earning less than 200% of the poverty threshold.

Montana’s final Secondary Test indicator is the “Revenues, Taxes, and Fees Burden Index,” which is calculated as:

This metric is intended to reflect the government revenue burdens of the local population, and includes the following three revenue streams from the Statement of Activities in the 2014 AFR (City of Chinook, 2015a): charges for services, fines, and forfeitures for governmental activities (\$0); charges for services, fines, and forfeitures for business-type activities (\$1,904,106); and property tax revenues for governmental activities (\$696,123). These revenues sum to \$1,790,229. Dividing by MHI (\$38,267 in 2014\$; see Exhibit 3-1) and indexing by population (1,210 based on U.S. Census Bureau, 2013a) yields a metric value of 3.9, which is weak.

Exhibit 4-5 shows the Secondary Test using Montana DEQ Guidance. The City has a Secondary Test score of 1.6 using this alternative approach (compared with 2.3 using EPA’s Guidance).

Exhibit 4-5: Secondary Score Metrics Based on Montana DEQ Guidance

Indicator	Result	Score	Data Source
Poverty Rate	12.5%	2	U.S. Census Bureau (2013b)
Low to Medium Income Percentage (LMI)	37.6%	2	U.S. Census Bureau (2013c)
Unemployment	4.80% [compared with 3.90% for the state]	2	June 2015 unemployment rate for Blaine County and Montana from Bureau of Labor Statistics
Median Household Income	\$35,656 [compared with \$46,230 for the state]	1	U.S. Census Bureau (2013b)
Property Tax, fees and revenues ¹ divided by MHI and indexed by population	3.9	1	Tax, fee, and revenue data from City of Chinook (2015a)
Secondary Score²		1.6	
<p>1. The “property tax, fees, and revenues” metric includes the following items from the Statement of Activities: charges for services, fees, and forfeitures for governmental activities; charges for services, fines, and forfeitures for business-type activities; and property taxes for governmental activities.</p> <p>2. Average of scores for the five indicators.</p>			

5 Substantial Impact Analysis

Given an MPS of 2.8% (or higher, using alternative scenarios; see Section 3), and a Secondary Score of 2.3 or 1.6 (using EPA's 1995 Guidance or Montana's modified Guidance, respectively; see Section 4), the Substantial Impacts Matrix (Exhibit 5-1) indicates that impacts from the project are likely to be substantial.

Exhibit 5-1. Substantial Impacts Matrix

Secondary Score	Municipal Preliminary Screener		
	Less than 1%	1% to 2%	Greater than 2%
Less than 1.5	?	X	X
1.5 to 2.5	✓	?	X
Greater than 2.5	✓	✓	?
Source: U.S. EPA (1995) X = impact is likely to be substantial ? = impact is borderline ✓ = impact is not likely to be substantial			

6 References

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7 Appendix: Description of the Economic Guidance for Water Quality Standards

In order to demonstrate that there would be substantial and widespread economic and social impacts justifying a variance, the discharger must demonstrate that it would face substantial financial impacts, and that the affected community would have significant adverse impacts as a result (i.e., widespread impacts). EPA's 1995 Guidance (U.S. EPA, 1995) outlines the specific steps that the discharger must follow to make these demonstrations. This appendix provides a brief overview of the Guidance as applicable to an entity in the public sector. For a more detailed description of the analysis, see U.S. EPA (1995).

First, to determine whether the pollution control project would entail a substantial impact to an entity in the public sector, there is a two part test. The first part of the test, called the Municipal Preliminary Screener (MPS), is a screening-level ratio designed to trigger additional tests or screen out the possibility of substantial impacts. Since municipalities will pass costs on to households and businesses, this screening is based on how household pollution control costs compare to household income. Generally, if the MPS is less than 1% (i.e., annual household pollution control costs would be less than 1% of median household income), there will not be a substantial economic impact. If the MPS is higher than 1%, then the impacts may be substantial and the discharger proceeds to the second part of the test.

The second part of the test involves calculating multiple indicators (e.g., bond rating, debt ratio, and tax collection ratio) designed to characterize the financial health and socioeconomic status of the community that will bear the costs of the pollution control. This is the Secondary Test.

Exhibit 7-1 shows the indicators used in the Secondary Test and the scores associated with them.¹² The overall Secondary Score is the average of the indicators used.

Exhibit 7-1. Secondary Test Indicators in EPA's Guidance

Indicator	Secondary Indicator Scores		
	Weak (Score of 1)	Mid-Range (Score of 2)	Strong (Score of 3)
Bond Rating	Below BBB (S&P) Below Baa (Moody's)	BBB (S&P) Baa (Moody's)	Above BBB (S&P) Above Baa (Moody's)
Overall Net Debt as Percent of Full Market Value of Taxable Property	Above 5%	2% - 5%	Below 2%
Overall Net Debt Per Capita	Greater than \$3,000	\$1,000 - \$3,000	Less than \$1,000
Unemployment	More than 1% above national average	National average	More than 1% below national average
Median Household Income	More than 10% below state median	State median	More than 10% above state median
Property Tax Revenues as a Percent of Full Market Value of Taxable Property	Above 4%	2% - 4%	Below 2%
Property Tax Collection Rate	< 94%	94% - 98%	> 98%

The MPS and Secondary Test results are evaluated jointly, using the Substantial Impacts Matrix, as shown in **Exhibit 7-2**.

Exhibit 7-2. Substantial Impacts Matrix

Secondary Score	Municipal Preliminary Screener		
	Less than 1%	1% to 2%	Greater than 2%
Less than 1.5	?	X	X
1.5 to 2.5	✓	?	X
Greater than 2.5	✓	✓	?
Source: U.S. EPA (1995) X = impact is likely to be substantial ? = impact is borderline ✓ = impact is not likely to be substantial			

If the evaluation indicates that the pollution control project will place substantial economic

¹² In some cases, if data for a particular indicator is not available, the Guidance directs users to alternative indicators. See U.S. EPA (1995) for more details.

burdens on the discharger, the next step is to determine whether the impacts will also be widespread in the surrounding community. This step involves estimating socioeconomic changes due to pollution control costs, such as loss of employment, changes in property values, and higher taxes. In this step, the analysis should consider the direct and indirect effects of control costs. Also, expenditures on pollution control costs are not likely to vanish from the community. These expenditures become business revenues and household incomes that can offset adverse financial impacts experienced by the affected entities.